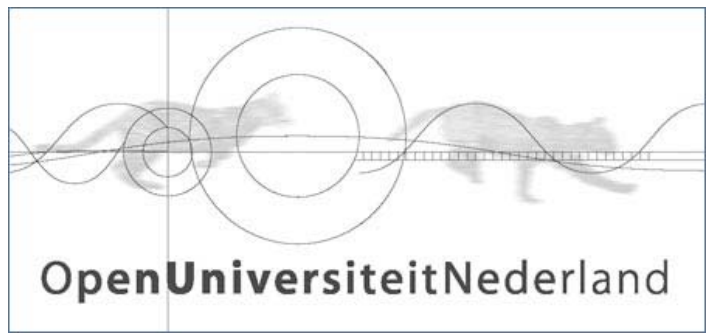
Integration of IMS Learning Design and eGames

<e-UCM>
e-learning group
http://www.e-ucm.es



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Contents

- Objective: Integration of IMS Learning Design and educational games
  - Definition of a communication model
  - Creation of sample games
  - Creation of a sample Unit of Learning
  - Implementation of the communication model
  - Evaluation of the proposal
- General data
  - Timeframe: 6 weeks
  - Host researcher: Daniel Burgos
  - Funding: <e-UCM> research group at Universidad Complutense de Madrid

The <e-UCM> research group

- Established in the early 90's under the direction of **Baltasar Fernández-Manjón** and **Alfredo Fernández-Valmayor**
- Areas of interest
  - E-Learning tools
  - E-Learning standards and specifications
  - Markup languages
  - Alternative approaches to learning
    - Skill development
    - Mobile Learning
    - Game-based Learning

- Prototype of a LMS supporting a simplified version of the original EML

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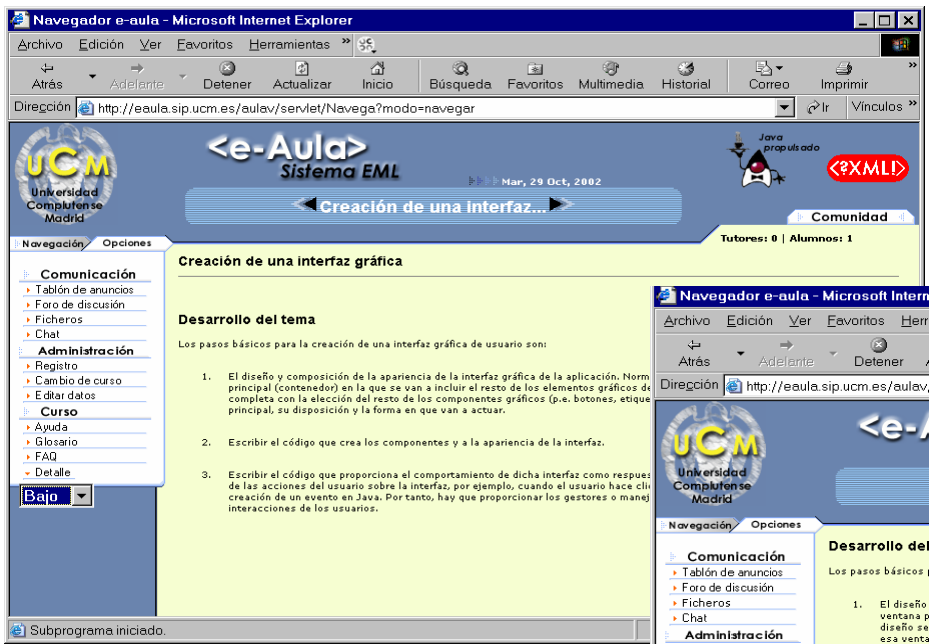

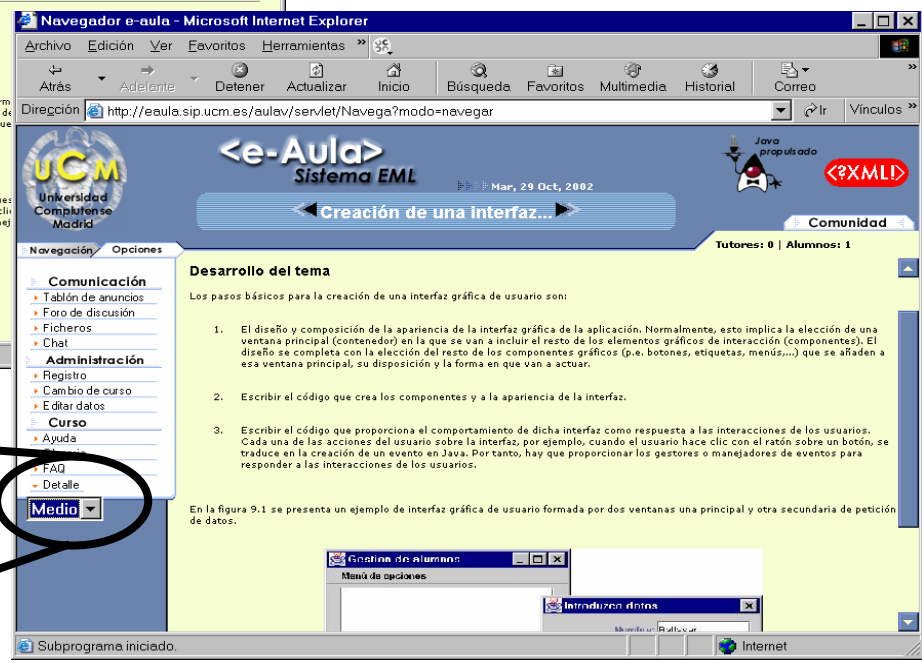

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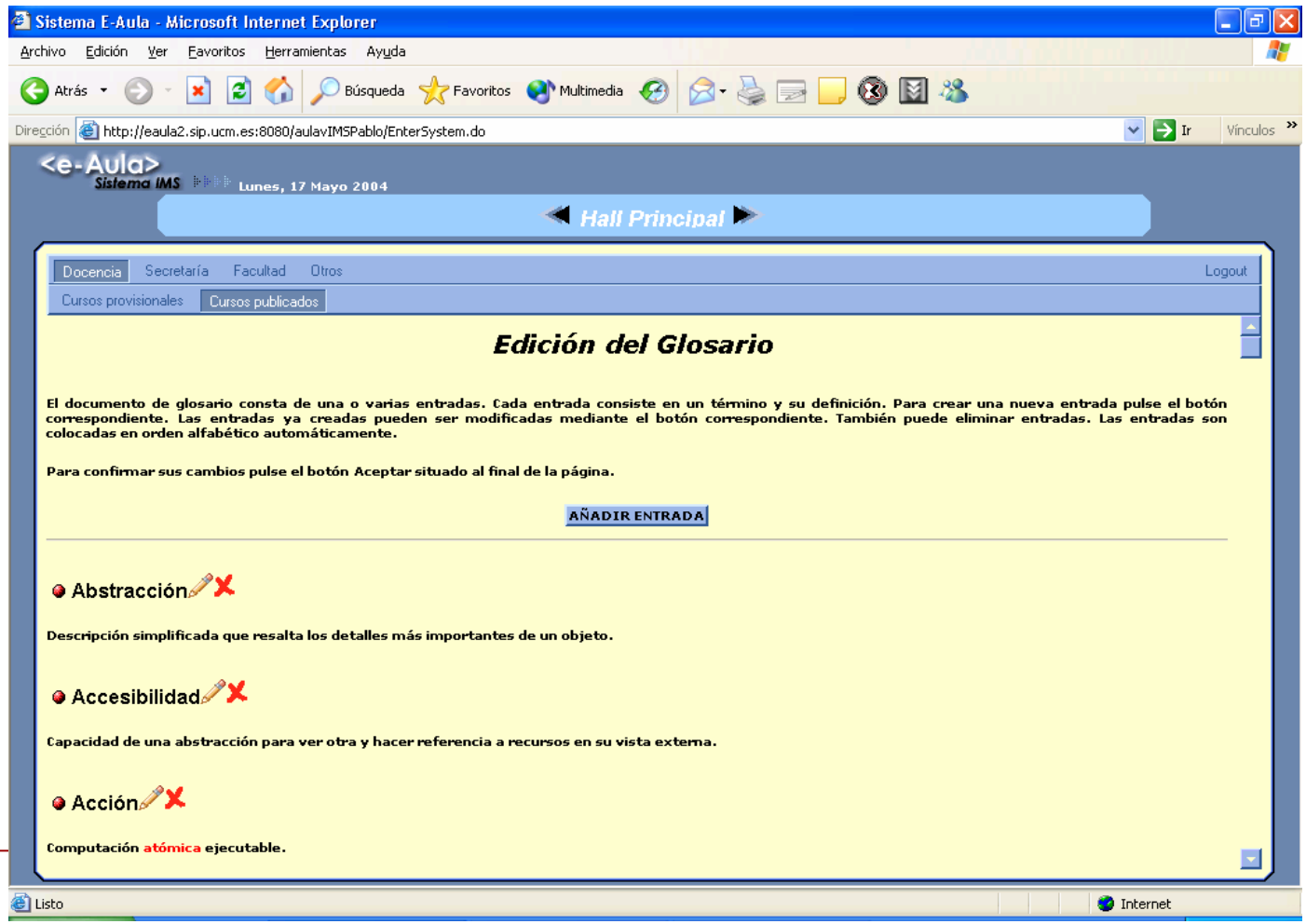
- Fully-featured LMS constructed around IMS Specifications (CP, SS, QTI, LIP)
  - Design and architecture driven by the specifications
  - Test-bed for further developments



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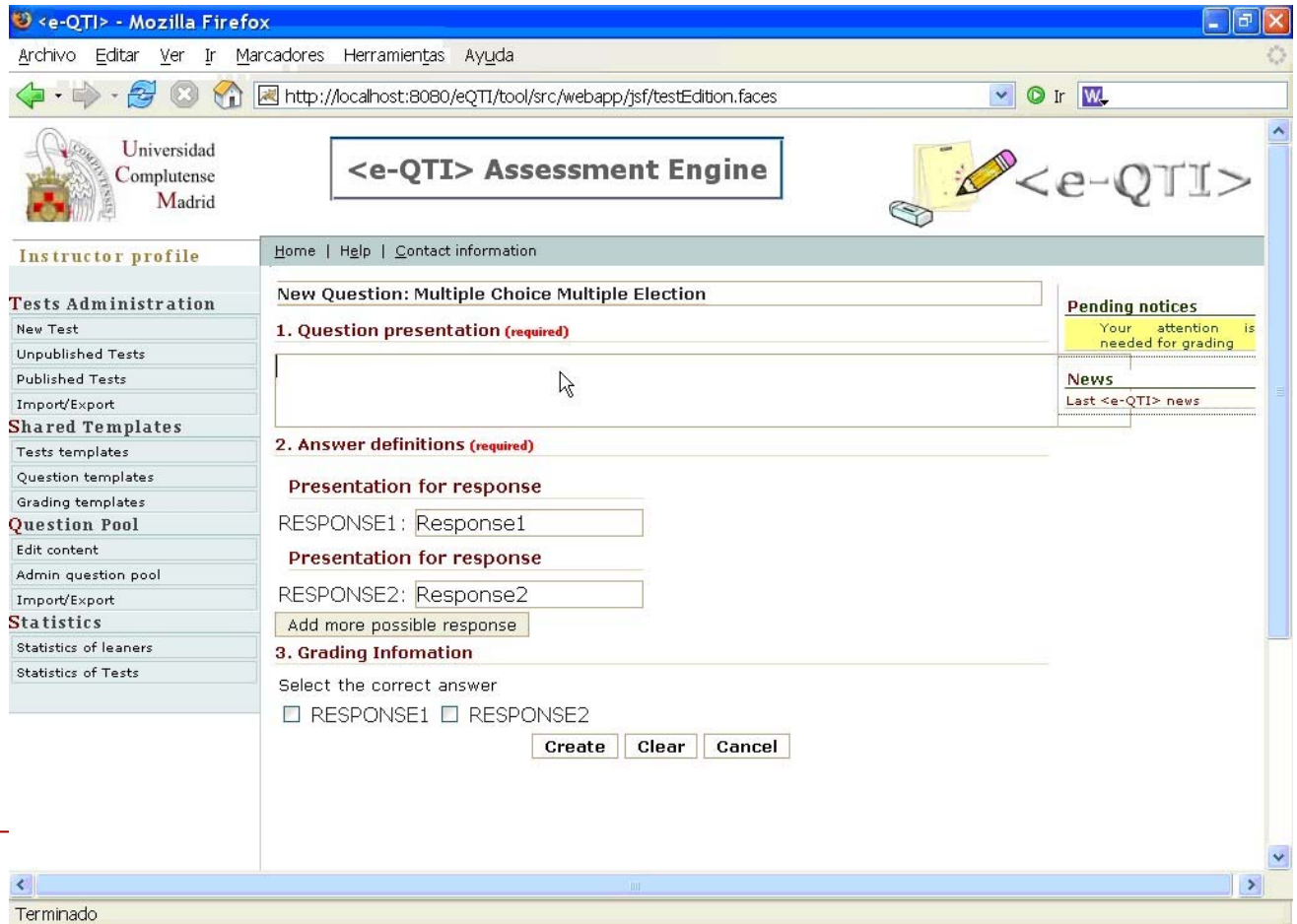
- Web-based editor / player for IMS QTI 2.0
  - Service oriented
  - Can work stand-alone or integrated in other platforms
  - Authoring, playing, question pools, import/export (WCT Quiz, HotPotatoes)



- Graphical editor for IMS-Learning Design
  - Developed as a Eclipse plug-in
  - Uses UML diagrams as graphical notation

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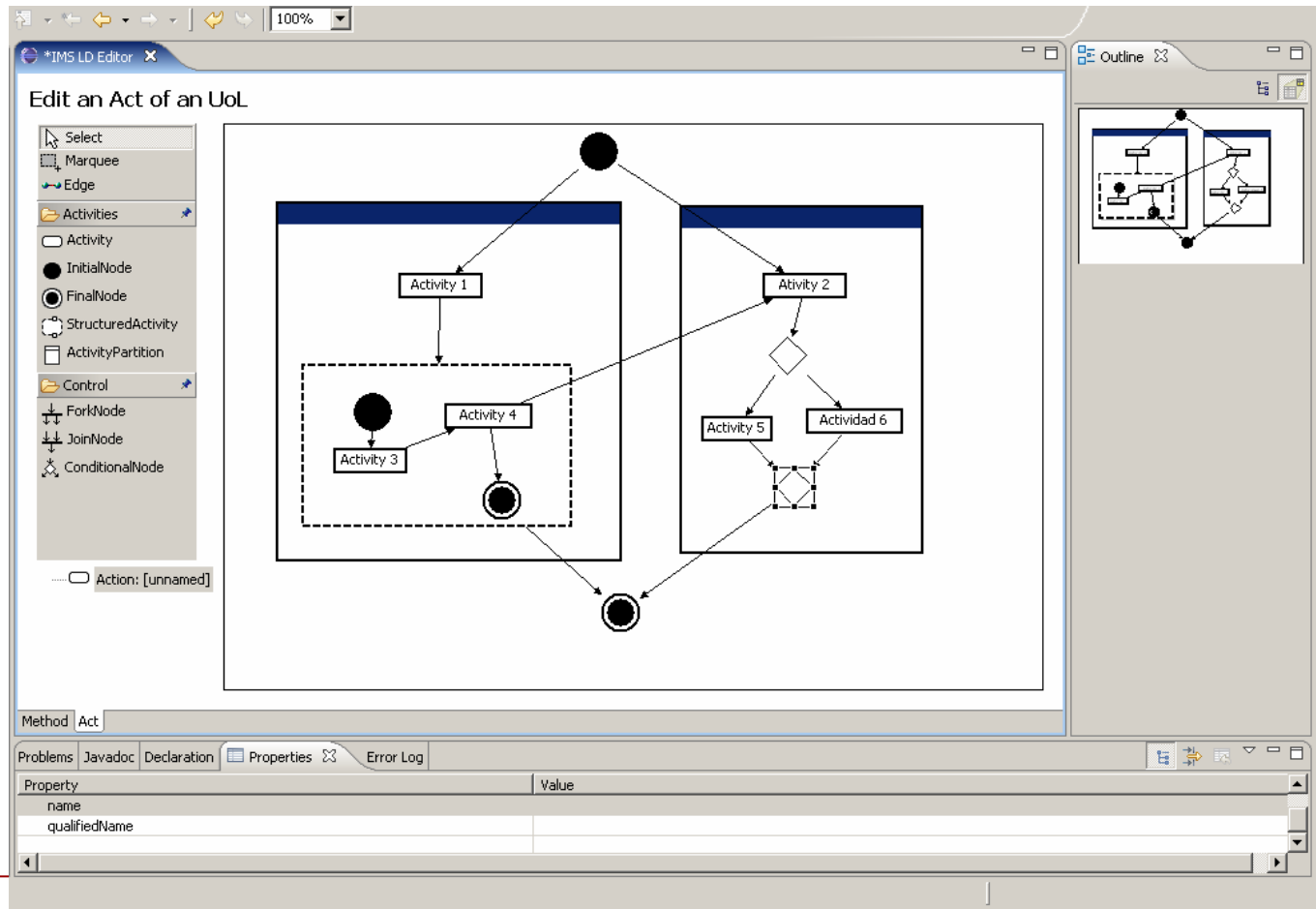

The <e-Game> research area

- Research & Development work in the field of games and education
- Addresses four main research questions
  - Educational game design
  - Authoring process
  - Assessment & grading
  - Integration with existing courseware
- <e-Adventure> as development project

- Complex design equation
  - Educational value
  - Fun and engagement
  - Eye-candy
- Looking for an appropriate genre…

(images © LucasFilm Ltd.)

- Point and Click adventure games

Designing Educational Adventure Games

- Study of the educational potential of the genre
  - Guidelines for writing interesting adventure scripts with educational value
  - Study of the different elements of the genre and description of their educational potential
    - What elements are key for the fun-factor?
    - What elements are key for the learning outcomes?
  - Full storyboards for educational adventure games in different fields
- Conclusions: The genre itself is suitable for learning, but we can add additional elements in the design
  - Three levels of description of game elements
  - In-game books that can include sections, titles, images and (eventually) hyperlinks
  - Tagging of game events according to their educational value

Authoring process

- Provide a simple authoring process to facilitate the incorporation of teachers or other domain experts in the development
  - Domain Specific Language to describe educational point n' click adventure games
    - XML language
    - Balance between "simple" and "powerful"
- Definition of a development process
  1. Provide the script / storyboard
  2. Add descriptive markup to the storyboard
  3. Create / gather art assets (sounds, music, graphics, animations…)
  4. Package the marked up script and the assets and feed them to the <e-Adventure> engine
  5. The engine generates and executes the game

Assessment & grading

- Independent definition of assessment rules
  - The instructor decides which game events are pedagogically relevant
  - Separate XML file with assessment rules included in the game package
- Monitorization the in-game experience
  - The engine monitors the activity of the learner within the game and matches it to the assessment rules
  - The activation of the assessment rules is logged and written to an XML file
  - Generation of reports with varying degrees of detail
  - The reports are used for grading

Integration with existing courseware

- <e-Adventure> games as Learning Objects
  - Potential integration in standards-compliant LMS
- Different integration approaches
  - Black-box integration
    - The game is launched as any static content
  - Deep integration
    - The engine includes an API to communicate with external systems
- Bi-directional communication
  - The engine can import an initial state and adapt the game according to input from the LMS (user profile)
  - The engine can broadcast the activation of the assessment rules to the LMS

Integration with IMS Learning Design

- Two main objectives for this stay
  - The design of a *generic* bidirectional communication method between an IMS Player and educational games
  - The implementation of this model enabling the communication between <e-Adventure> and a CopperCore + CCSI + SLeD environment
- Two resulting products
  - Modified versions of SLeD and CCSI enabling generic bidirectional communication with games
  - An environment to be deployed along CCSI enabling the specific communication with <e-Adventure> games

CopperCore + CCSI + SLeD

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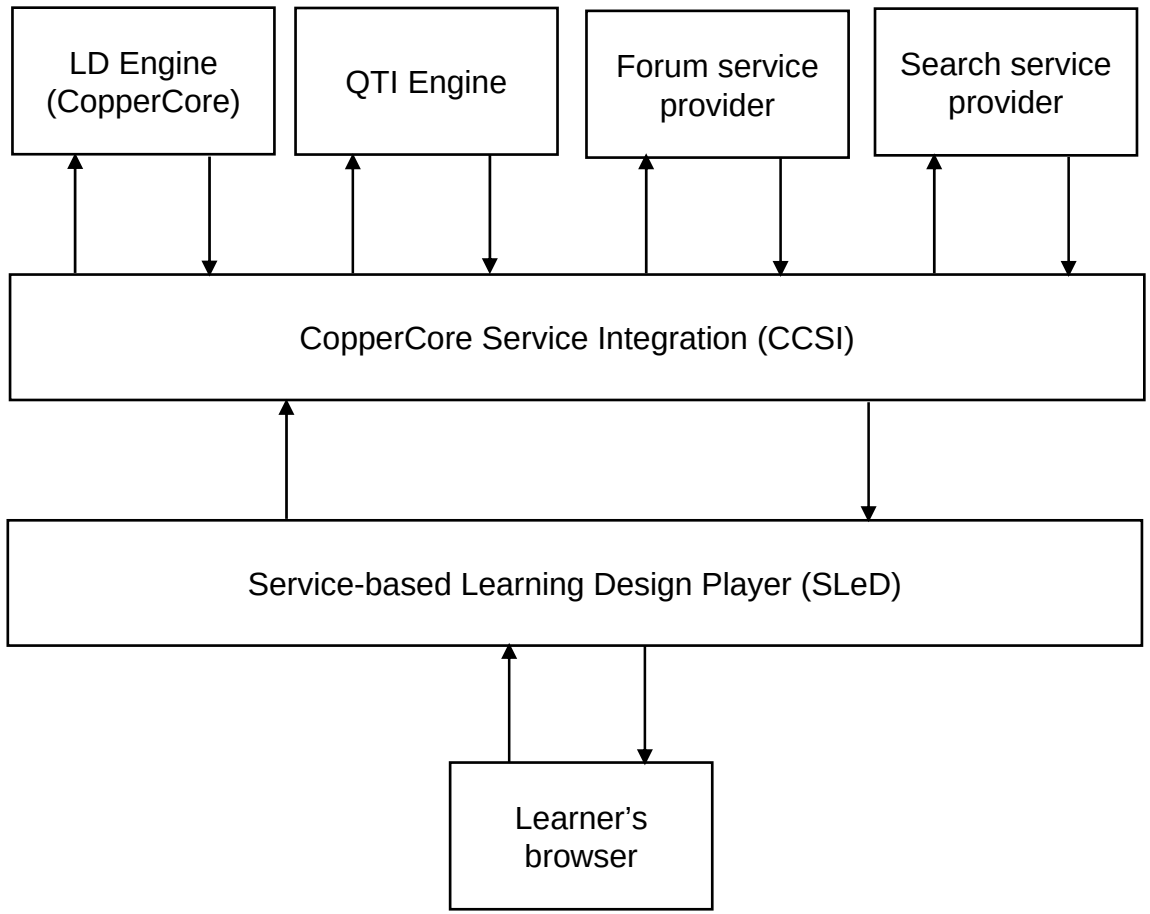
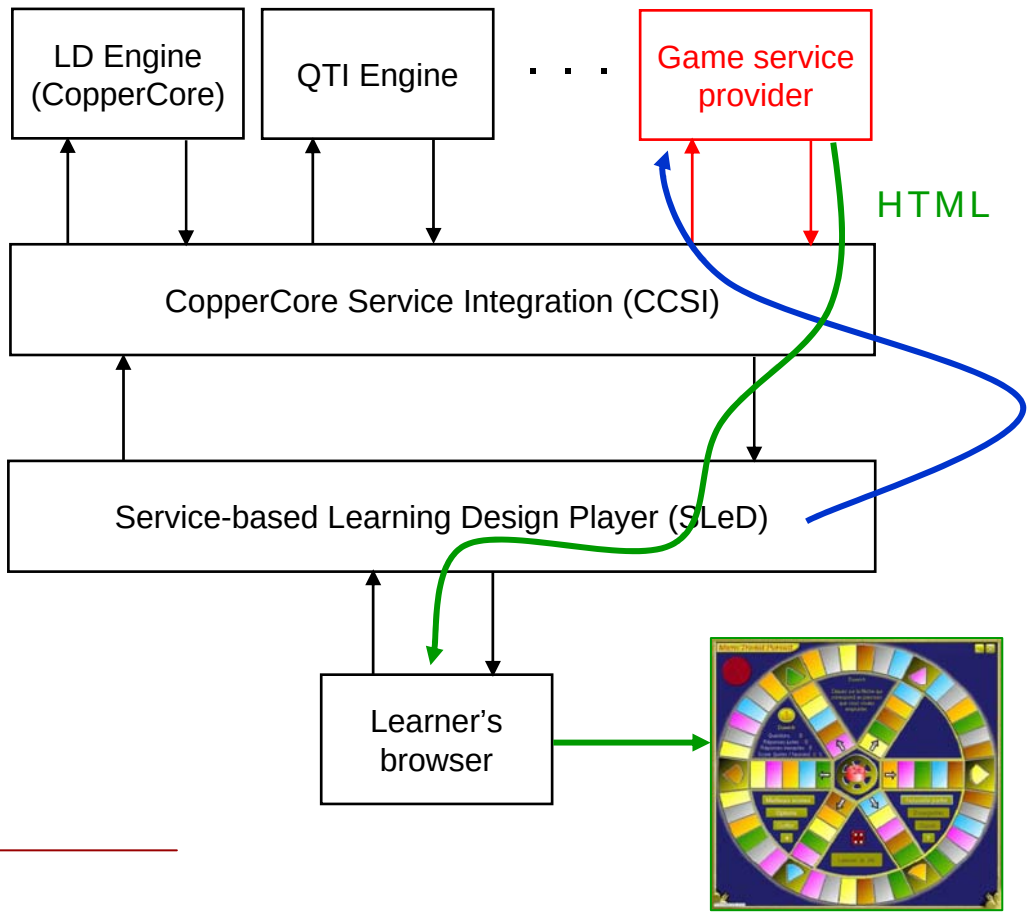


Launching game content within the SLeD/CCRT player

Contents

- Presentation
- About <e-Ucm>
- <e-Adventure>
- Integration with IMS Learnign Design
- Preliminary results and future work
- Conclusions and discussion

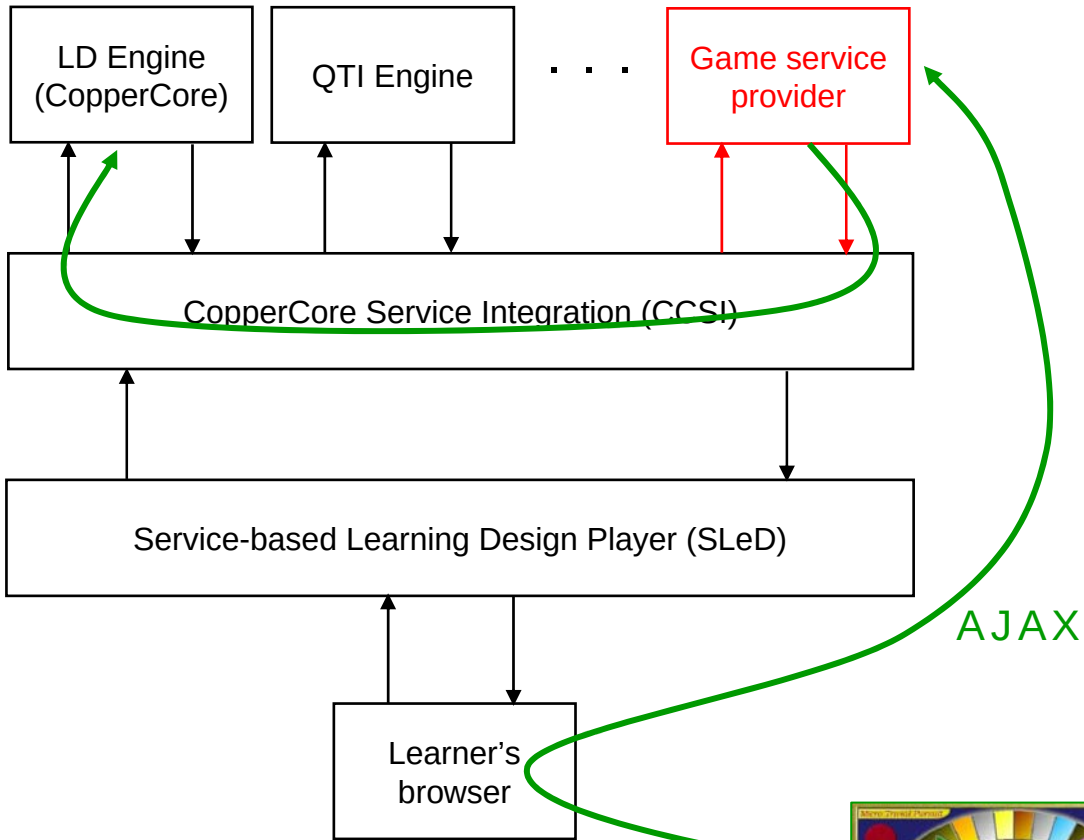
- Design assumption
  - Contents can be launched by interpreting some HTML code in the learner's browser
  - Flash, Applet, Java WebStart …



Let the game affect the Unit of Learning

- Games can report what happens while the user interacts with the content
- But, what information should be reported?
  - The most common unit of information in a UoL are its properties
  - Games are studied in terms of their *states*
  - Proposal: Associate specific game states with property-value pairs in the UoL
- When the games enter states associated with properties, the event is notified to the engine
  - Design decision: Notify the event when it happens, don't wait until the game ends

Architecture of the solution



Let the Unit of Learning affect the game

- Games are a rich and adaptable medium
  - Let's use this to our advantage
- Adaptable games
  - Rich content can query the player for the state of the properties and act in consequence
  - Games can be easier/harder, longer/shorter, internationalized, omit uninteresting levels, change the possible end-states, etc.
- Design decision: The game changes its initial state according to the properties of the Unit of Learning

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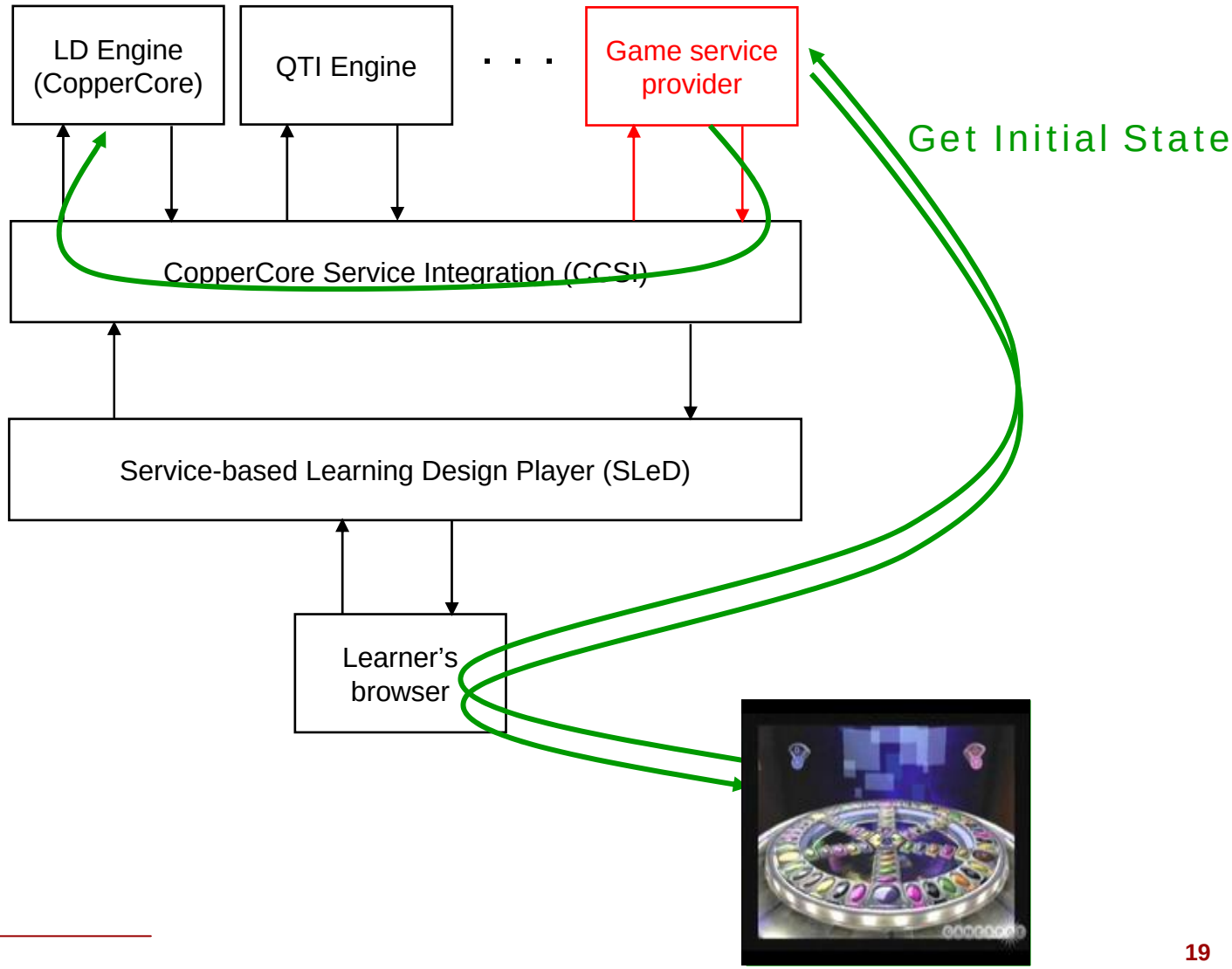
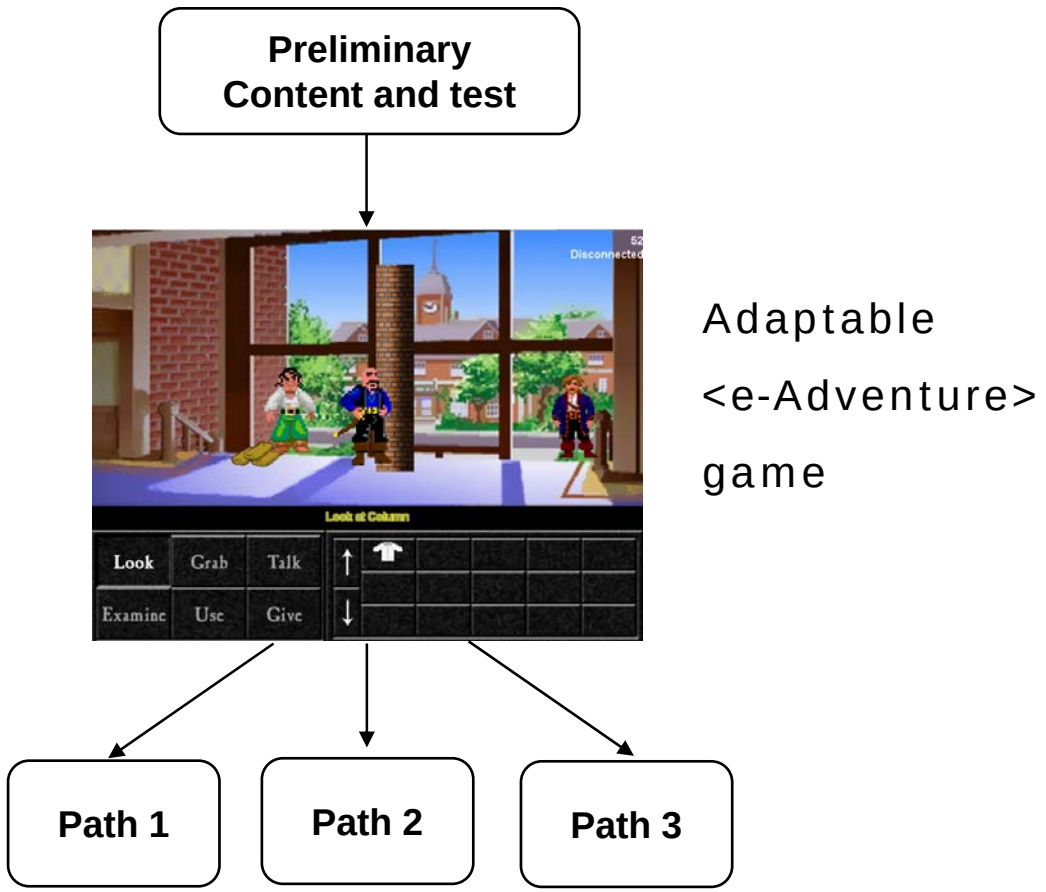


Preliminary Results (I)

- Modified version of SLeD
  - Recognizes a new content type “gamecontent”
  - Tries to locate (through CCSI) a game service to request the HTML code required to launch the game
- Modified version of CCSI
  - New generic adapter interface: GameAdapter
  - New adapter implementation: EAdventureAdapter
- eAdventureWebSupport web application
  - Provides the game service that generates the HTML code for <e-Adventure>
  - Provides listeners for the AJAX-invocations coming from the games
  - Uses CCSI to push and retrieve information from the CopperCore engine
  - Can be deployed in the same container as CCRT and SLeD
- AJAX implementation of the communication API for generic game applets

- Sample Unit of Learning: The art and craft of chocolate



Adaptable <e-Adventure> game

Future work

- Inclusion of the modifications in future versions of SLeD and CCSI
- Publish the eAdventureWebSupport application as opensource application
- Publish the communication APIs and data models
- Evaluation of the integration model
  - Integration of games other than <e-Adventure> games using the generic products obtained in this work
- Global reflection
  - Can this be extended to include all kinds of “intelligent” content?

Conclusions and discussion

- Can the activities of a Unit of Learning be games? YES
- Does this have any advantages? YES
  - Adaptable content
  - Higher interactivity
  - Live report of results
- Does this work for any kind of game?
  - *Most* games can be deployed and launched as black boxes
  - Establishing a communication requires the game to be aware of its environment and to participate in the communication
- Value for CopperCore and CCSI
  - The communication CC → EA builds on the experience integrating CC and QTI
  - The communication EA → CC is new and should be evaluated
- Value for SleD
  - An experience in the introduction of a new content type
  - How can this procedure be made more modular?

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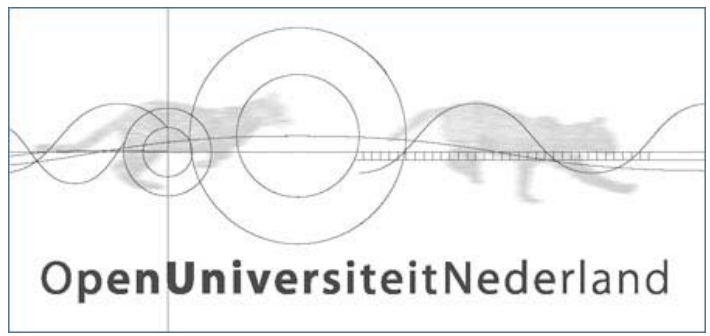

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